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Zellma Grunden

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PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Customer No.:	23641
Application No.:	10/630875
Confirmation No.:	7941
Filing Date:	July 30, 2003
Attorney Docket No.:	29595/82608
First Named Inventor:	Garry E. Balthes
Group Art Unit:	1771
Examiner Name:	Jennifer A. Boyd
Title:	LAMINATED COMPOSITION FOR A HEADLINER AND OTHER APPLICATIONS

Certificate Under 37 CFR 1.8(a)
I hereby certify that this correspondence is being facsimile transmitted to Examiner Jennifer Boyd, United States Patent and Trademark Office; Fax No. (571) 273-8300.

on August 28, 2006

Zellma Grunden

AFFIDAVIT PURSUANT TO 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir or Madam:

I declare as follows:

1. I, Garry E. Balthes, am currently the President of Research, Development and Consulting at FlexForm Technologies, LLC. I have been employed at FlexForm Technologies, LLC since March of 2001.

2. I am a named inventor of the above-referenced patent application and an employee of the Appellant. I am, therefore, knowledgeable about the disclosure and claims therein.

3. I have experience with composite and laminated structure technologies. I have been developing and manufacturing such composites since August 1992. Prior to this date, I served as Manager of Research and Development for 15 years, mostly in mechanical construction, and have previously received both Canadian and United States Patents on mechanical inventions.

4. I understand that in an Advisory Action dated May 24, 2006, in the above-identified application, the Examiner maintained that a headliner is defined as "the fabric covering the inside roof of an automobile." This definition is wrong and is not the subject matter being claimed. Although a headliner does cover the inside roof of an automobile as the Examiner's definition states, the claimed invention is not a "fabric." Typically a fabric is used to cover the headliner, but the fabric is considered in the industry as nothing more than a fascia covering offering only aesthetics and touch appeal.

5. Those skilled in the art know a headliner is a strong, rigid body molded in a three-dimensional shape that conforms to the contours of the outer steel shell of a vehicle roof. The headliner is self-supporting outside the areas of direct mounting points at the A, B, and C columns and front and rear glass lines. Typically, the headliner spans the entire area of the inside upper vehicle passenger compartment and provides most of the acoustical impedance that is transferred through the steel roof portion during normal vehicle operation.

6. In addition to evidence submitted in my prior Affidavits, I am submitting the following supplemental documents: "Toyota Engineering Standard TSF7762G," "Johnson Controls Product Testing Section," "Cantilever Beam Sag Test," and "Johnson Controls on Strength, Stiffness, Toughness (SST) Test." The "Toyota Engineering Standard . . ." document compliments the "Statement of Work for Class 3 Recyclable Headliner" document submitted with my Affidavit dated May 10, 2006. This "Toyota Engineering Standard . . ." requires, among other things, that the sag experienced under environmental conditions be less than 10mm. The "Cantilever Beam Sag Test" document demonstrates how such a test is carried out. One

skilled in the art would recognize that a mere fabric would fail to serve as a headliner in that it would sag or bend much more than 10mm with very little effort. Further demonstrating what is known to those skilled in the art as a "headliner" is in the "Johnson Controls Product Testing Section" document. Among several other tests that apply to a headliner, on page 1 Test Letters "A" and "B" demonstrate the environmental conditions that a potential "headliner" is subjected to and how it must react in order to qualify as a "headliner." For example, pursuant Test Letter "A," a sample is subjected to a temperature of 100°C (212°F) and then tested for rigidity. In this case, the "headliner shall not sag more than 1.7mm along the front edge prior to exposure . . ." and the "headliner shall not sag more than 6mm anywhere along the front edge nor more than 10mm anywhere else after exposure . . . ." Test Letter "B" requires the same results, but under different environmental conditions. The point of these tests is to prove that a particular structure is rigid enough to be a headliner. Those skilled in the art would clearly understand that a mere "fabric" does not qualify as a "headliner for a vehicle." To have any non structural fabric meet these requirements would require the material to be pre tensioned, a process that is simply not employed in any known vehicle headliner assembly currently being manufactured.

7. It is typical that a headliner can have a decorative fabric material applied thereon. This fabric, however, is not the headliner, but rather merely a fabric applied to the headliner. Moreover, a mere fabric is not what was invented. Applying a mere decorative fascia to what those skilled in the art know to be a headliner is an erroneous identification of the claimed invention. On its face a mere "fabric" is simply inconsistent with Claim 19. The claimed headliner includes a headliner core layer with a permeability-resistant film layer on one side, a woven fiber layer on the other, and a film layer located over the woven layer. The woven layer itself is not the headliner.

8. Pictures of a flexible convertible roof top and a rigid headliner are shown in the Appeal Brief. These pictures are believed to be accurate representations of a convertible top and a headliner. Of particular note is that the convertible top is the roof of the vehicle, not a liner for a roof (contrary to the Examiner's new definition for headliner) and that the flexible convertible roof must bend in order for it to qualify as such a roof, whereas the headliner, shown suspended between two chairs, remains rigid. Attached to this affidavit are additional pictures of a vehicle headliner demonstrating its rigidity.

9. It is my further understanding that the Examiner rejected Claim 20 under 35 U.S.C. § 103(a) as being obvious under Jarrard (U.S. Patent No. 6,871,898) in view of Spengler (U.S. Patent No. 5,709,925). Essentially, the Examiner argues that one would be motivated to combine natural fibers suggested by Spengler to the foam layer of Jarrard because the fibers are functionally equivalent fibers based on cost and availability of natural fibers and the desired characteristics of the panel.

10. To the contrary, the headliner of Claim 20 is a very rigid and non-flexible panel. The claimed composition comprises about 35% to 45% sisal, about 25% to 35% natural fiber, and only 25% to 35% polypropylene binder. About 65% to 75% of the headliner core layer is fiber. It is counter-intuitive to combine so much sisal and other natural fibers to a flexible cover, because the result is highly rigid structural panel. Spengler teaches a composite for use as a headliner having "sufficient strength and stiffness to form self-supporting automobile interior panels . . ." Col. 2, lns. 9-10. The teachings of Spengler are, in fact, the opposite of the teachings of Jarrard. Accompanying this Affidavit is a third party description of sisal that identifies it as a "strengthening agent."

11. Also accompanying this Affidavit is a sample portion of a typical headliner. This sample was taken from the left (driver side) front corner of the headliner. The headliner is clearly a very rigid structure, not a flexible fabric.

12. The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and, further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Serial No. 10/630875
Docket No. 29595-82608

Declared at Elkhart, Indiana, this 28th day of August, 2006.

Garry E. Balthes

State of Indiana)
) ss:
County of Elkhart)

On this 28th day of August, 2006, before me, a Notary Public in and for the County and State aforesaid, appeared Garry E. Balthes, to me personally known to be the same person whose name is subscribed to the foregoing instrument, and acknowledged that he executed said instrument as his free and voluntary act and for the uses and purposes therein expressed.

Notary Public

Nancy R Peterson
Printed Name

My Commission Expires: 2/4/12
County of Residence: LaGrange

TEST METHOD REGARDING MATERIAL PROPERTIES FOR ROOF HEADLININGS

1. Scope

This standard covers the test methods for the suitability of automobile roof headlinings (hereinafter referred to as "product") in working environment by examining the items regarding the plastic material characteristics. Functions, performance, and design quality of product as installed in vehicle or a single item shall comply with the indications in separate drawings etc. The test conditions and judgment criteria provided in this standard are standard conditions. If test conditions or quality requirements vary according to vehicle model, installation position, destination, etc., the test conditions and judgment criteria shall be specified in respective drawings without conforming to this standard. Materials applied in this standard are TSL3610G and TSL2612G for surface material and TSL3603G, TSL3609G, TSL3615G, and TSL3616G for base material. Use of plastic materials other than these shall be decided by consultation.

2. Material, Shape, and Dimension

Material, shape, and dimension of the product shall be in accordance with indications in separate drawing.

3. Performance

(1) Appearance

Roof headlinings shall be free from any defects in appearance such as irregular color, unevenness, wrinkling, flaws, staining, glossiness and adhesive separation, and shall conform to the permissible limit samples to be specified separately.

(2) Properties

Roof headlinings shall conform to the requirements specified in Table 1 as tested under Section 4:

Prepared and Written by:
Organic Material Dept.
Material Engineering Div. 2

Engineering Administration Div.

Established/ 10 Revised:
Dec.2002

Table 1 Roof Headlining Property Requirement

Item		Property requirement	
		Molded ceiling	Suspended ceiling
Heat resistance	Appearance	Free from defects in appearance such as surface peeling, wrinkling, deformation, torn seam and retainer separation.	
	Sagging (mm)	Sample general area: less than 10 mm(2) Sample outer circumference: as per drawing indication(2)	
Humidity/cold/thermal cycle resistance	Appearance	Free from defects in appearance such as surface peeling, wrinkling, deformation, torn seam and retainer separation.	
	Sagging (mm)	Sample general area: less than 10 mm(2) Sample outer circumference: as per drawing indication(2)	
Light resistance	Discoloration/fading (Grade)	Discoloration: grade 4 or better; fading: grade 3 or better	
	Deterioration	Free from such defects as fissuring and pile unraveling	
Heat aging resistance		Free from defects in appearance such as discoloration, wrinkling and surface peeling	Free from defects in appearance such as discoloration and wrinkling
Humidity aging resistance			
Peeling strength (N/25 mm)	In original state	4.9 min., or surface material or base material shall be subjected to fracture.	---
	After heat aging		
	After humidity aging		
Creeping (mm)		50 max. Report the peeled state.	
Flammability (mm/min)	In original state	100 or less, non-combustible or self-extinguishing	
Glass fogging rate (%)		Method A; 15 max. Method B; 85 min.	
Retainer strength (N)	In original state	Report the strength.	---
	After heat aging		
	After humidity aging		
	At low temperature		
	At high temperature		
Permeability (L/cm²/s)		Report	
Ventilation staining (Grade)		Grade 3 or better, report the staining No spot and staining.	
Odor		Strength	According to TSM0505G-1.
		Degree of unpleasantness	
		Quality	

Note: (1)
May be specified separately for individual vehicles.
Note: (2)
Refer to Fig. 1 for explanation of allowable sagging.

Established/ 10 Revised: Dec.2002

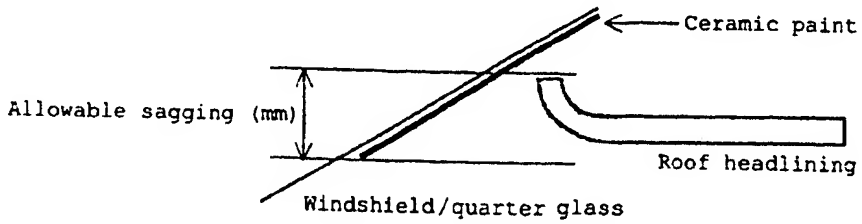

Fig. 1

4. General Test Conditions

(1) Standard conditions of laboratory

The tests should be carried out under standard conditions of 23 ± 2℃ and 50 ± 5% RH. If the laboratory cannot be maintained under the standard conditions, however, the temperature and humidity during testing shall be reported with the test data.

(2) Number of specimens

At least three specimens should be used unless otherwise specified.

5. Test Methods

5.1 Heat Resistance Test

Install the headlining and its adjacent parts on a cut body equipped with the actual roof panel of the vehicle, and maintain it for 24 h in a thermostatic chamber set at 90 ± 2℃. Then remove it and condition for 1 h at 23 ± 2℃. Check for any defects in appearance, of a general surface and measure the sagging of the ceiling. Maintain it for 24 h in the thermostatic chamber set at 100 ± 2℃. Then remove it and condition for 1 h at 23 ± 2℃. Check for any defects in appearance of front and rear portions.

5.2 Humidity/Cold/Thermal Cycle Test

Install the headlining and its adjacent parts on a cut body equipped with the actual roof panel of the vehicle. Carry out the test cycle given in Table 2 four times. Condition for 24 h at 23 ± 2℃, and check for any defects in appearance, and measure the sagging of the ceiling.

Table 2

Sequence	Conditions	Time (h)
1	50 ± 2℃, 95 ± 5% RH	23.5
2	23 ± 2℃	0.5
3	-30 ± 2℃	7.5
4	23 ± 2℃	0.5
5	90 ± 2℃	15.5
6	23 ± 2℃	0.5

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5.3 Light Resistance Test

Light resistance shall be tested by either of Method A, Method B, or Method C.

5.3.1 Method A Fade-O-Meter

Remove the base material from the specimen sampled out of a headlining product, leaving only the surface material (including the foamed layer). Install the specimen in a Fade-O-Meter[3], and carry out the test under the irradiating conditions given in Table 3. Then remove it and compare with an unexposed product to check for discoloration, fading and deterioration. Express the degree of discoloration and fading as a grade, as given in Table 4.

Table 3

Type of surface material	Irradiation time (h)	
	Discoloration/fading	Deterioration
Vinyl chloride TPO	400	
Fabric	200	400

Note: (3)
Standard conditions of the Fade-O-Meter shall be as follows: one carbon arc lamp, distance between the light source and the specimen; 250 mm, inside temperature; 55 to 65℃, sample rack black panel temperature; 83 ± 3℃, relative humidity; 30 to 50%, arc voltage; 120 to 145 V, current; 15 to 17 A, and the sample revolution speed; 3 to 4 turns/min.

5.3.2 Method B Xenon Lamp (Atlas Ci35W)

(1) Preparation of specimens

Prepare one specimen each of 65 mm in width and 150 mm in length for all design patterns with its length parallel to the warp of the fabric. However, when all colors cannot be included in a single specimen because of the pattern of the fabric, use more specimens so that all colors can be tested. The size of the specimen may be adjusted to fit in the specimen holder to used.

(2) High-temperature color fastness to light test

(a) As the testing equipment, use Atlas Model Ci35W.

(b) Set the specimen to the holder with the pile lay directed downwards if it has pile. Make sure that the irradiated surface of the specimen faces the light source. In addition, the irradiated surface of the specimen should not protrude excessively from the holder (see Fig. 2).

(c) With the specimen set to the holder in this condition, cover its irradiated surface with an ultraviolet shielding glass[4][5] and attach to the testing equipment, then irradiate with the 750 kJ of ultraviolet rays.

(d) Then, remove the specimen from the holder and examine the state of discoloration and fading. For a specimen with back coating, examine also the state of hardening and discoloration of the back coating.

(e) Evaluate the degree of discoloration and fading as a grade using the Gray Scale. (see Table 4) for Discoloration and Fading.

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Note: (4)
Ultraviolet shielding glass
(a) Thickness: 3.0 mm
(b) Material: Soda-lime glass with the spectral transmittance shown in Fig. 3. The test may be carried out with other glass according to the type of the vehicle tested, or with no glass at all.
(c) Service limit: 2000 h (lamp irradiation time)
Note: (5)
Air flow speed between the glass and the specimen must not exceed 0.5 m/s. The state where the glass is installed on the holder is shown in Fig. 4.

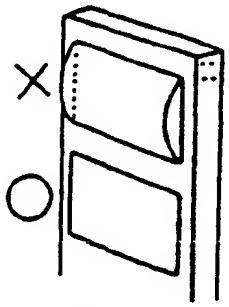

Fig. 2

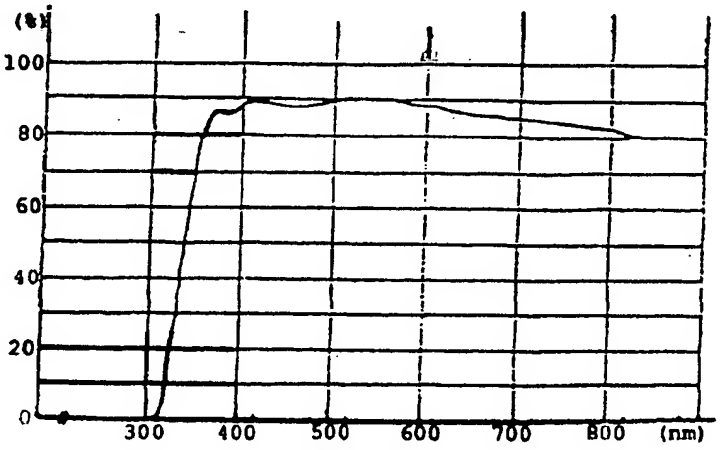

Fig. 3

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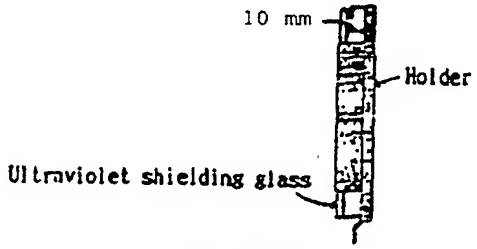

Fig. 4

(3) Reporting

For each of the design patterns, report the degree of discoloration and fading of the test piece by a grade given in Table 4. Also, report any hardening or discoloration of the back coating.

<Standard conditions for Atlas Ci35W>

(a) Irradiance: 0.55 W/m^2 (340 nm)

(b) Filter:

Inside; Quartz (service limit: 400 h)

Outside; Borosilicate soda (service limit: 2000 h)

(c) Lamp: Water-cooled 6.5 kW xenon lamp

(d) Black panel temperature of specimen rack:

89 ± 3℃ for irradiation phase

38 ± 3℃ for non-irradiation phase

(e) Relative humidity:

50 ± 5% for irradiation phase

95 ± 5% for non-irradiation phase

(f) Cycle time:

3.8 h for irradiation phase

1.0 h for non-irradiation phase

Table 4

Grade	Criteria
5	Discoloration/fading shall be No.5 of standard Gray Scale(6)
4	Discoloration/fading shall be No.4 of standard Gray Scale(6)
3	Discoloration/fading shall be No.3 of standard Gray Scale(6)
2	Discoloration/fading shall be No.2 of standard Gray Scale(6)
1	Discoloration/fading shall be No.1 of standard Gray Scale(6) or more

Note: (6)

The Gray Scale shall be in accordance with AATCC Evaluation Procedure 1 or ISO105A-01, A-02.

Established/ 10 Revised:
Dec.2002

5.3.3 Method C Xenon Lamp (Suga SC-700FT)

(1) Preparation of specimens

Prepare one specimen each of 65 mm in width and 150 mm in length for all design patterns with its length parallel to the warp of the product. However, when all colors cannot be included in a single specimen because of the pattern of the product, use more specimens so that all colors can be tested. The size of the specimen may be adjusted to fit in the specimen holder to be used.

(2) High-temperature color fastness to light test

(a) As the testing equipment, use Suga Model SC-700FT.

(b) Set the specimen to the holder with the pile lay directed downwards if it has pile. Make sure that the irradiated surface of the specimen faces the light source. In addition, the irradiated surface of the specimen should not protrude excessively from the holder (see Fig. 5).

(c) With the specimen set to the holder in this condition, cover its irradiated surface with an ultraviolet shielding glass[7][8] and attach it to the testing equipment, then irradiate with the 38 cycles of ultraviolet rays.

(d) Then, remove the specimen from the holder and examine the state of discoloration and fading. For a specimen with back coating, examine also the state of hardening or discoloration of the back coating.

(e) Evaluate the degree of discoloration and fading as a grade using the Gray Scale (see Table 4) for Discoloration and Fading.

Note: (7)
Ultraviolet shielding glass
(a) Thickness: 3.0 mm
(b) Material: Soda-lime glass with the spectral transmittance shown in Fig. 6. The test may be carried out with other glass according to the type of the vehicle tested, or with no glass at all.
(c) Service limit: 2000 h (lamp irradiation time)
Note: (8)
Air flow speed between the glass and the specimen must not exceed 0.5 m/s. The state where the glass is installed on the holder is shown in Fig. 7.

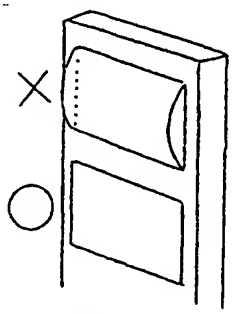

Fig. 5

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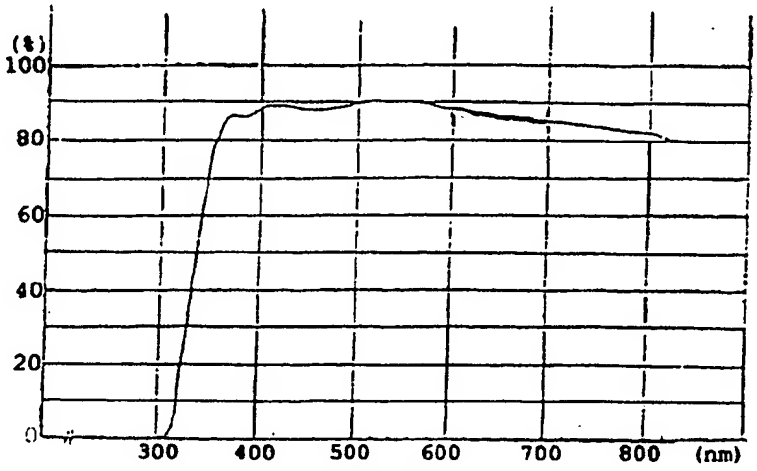

Fig. 6

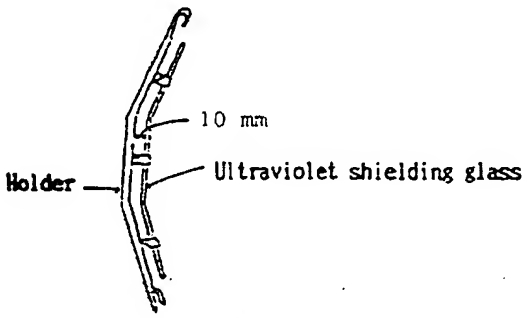

Fig. 7

(3) Reporting

For each of the design patterns, report the degree of discoloration and fading of the test piece by a grade given in Table 4. Also, report any hardening or discoloration of the back coating.

<Standard conditions for Suga SC-700FT>

(a) Irradiance: 150 W/m^2 (300 to 400 nm)

(b) Filter:

Inside; Quarts (service limit: 1000 h)

Outside; Borosilicate soda (service limit: 1000 h)

(c) Lamp: Water-cooled 7.0 kW xenon lamp

(d) Black panel temperature of specimen rack:

73 ± 3℃ for irradiation phase

38 ± 3℃ for non-irradiation phase

(e) Relative humidity:

50 ± 5% for irradiation phase

95 ± 5% for non-irradiation phase

Established/ 10 Revised: Dec.2002

(f) Cycle time:
3.8 h for irradiation phase
1.0 h for non-irradiation phase

5.4 Heat Aging Resistance Test

Heat the headlining product for 400 h in a thermostatic chamber held at 90 ± 2℃, then remove it and check for any defects in appearance.

5.5 Humidity Aging Resistance Test

Maintain the headlining product for 400 h in a thermo-hygrostatic chamber held at 50 ± 2℃ and a relative humidity of 95 ± 5%, then remove it and check for any defects in appearance.

5.6 Peeling Strength Test

(1) In original state

Sample out specimens of 150 × 25 mm parallel to the longitudinal and lateral directions of the headlining products from their ordinary portions. Peel from one end of the specimen (Fig. 8). Secure the peeled surface material and base material separately with the chucks of an Instron type tensile tester, and peel at a velocity of 200 mm/min. Observe the condition of peeling and find the mean of the maximal values (excluding abnormal values) from the chart thus obtained in order to determine the peeling strength (N/25 mm).

(2) After heat aging

Condition a headlining product subjected to the heat aging resistance test in accordance with Section 5.4 above for at least 24 h at 23 ± 2℃. Then carry out the test of Section 5.6 (1) above to determine the peeling strength (N/25 mm).

(3) After humidity aging

Condition a headlining product subjected to the humidity aging resistance test in accordance with Section 5.5 above for at least 24 h at 23 ± 2℃. Then carry out the test of Section 5.6 (1) above to determine the peeling strength (N/25 mm).

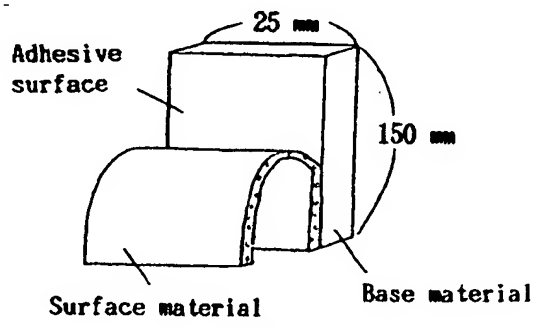

Fig. 8

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5.7 Creep Test

Maintain a specimen prepared in the same manner as in Section 5.6 (1) above for 24 h in thermostatic chamber set at 90 ± 2℃ under a load of 0.98 N and measure the peeled length (mm) (Fig. 9).

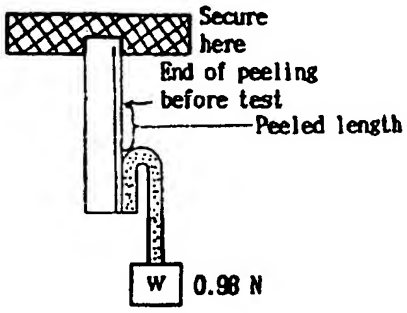

Fig. 9

5.8 Flammability Test

Sample out specimens parallel to the longitudinal and lateral directions of the headlining products, and find the burning rate in accordance with TSM0500G.

5.9 Retainer Strength Test

(1) In original state

Sample out specimens of 80 × 150 mm from the portion of the headlining product including the retainer. Install the specimen on the jig shown in Fig. 10, and pull it at a velocity of 200 mm/min using an Instron type tensile tester to find the peeling strength (N).

Established/ 10 Revised:
Dec.2002

5.10 Permeability Test

Sample out three specimens of about 180 × 180 mm from the headlining products. Install the specimen at one end of the cylindrical unit of the tester as shown in Fig. 11. Adjust the suction fan by means of the rheostat so that the inclined-tube manometer shows 124.5 Pa pressure. Find the air flow rate through the specimen in $L/cm^2/s$ based on the pressure indication on the vertical tube manometer and the breather used, using the table attached to the tester.

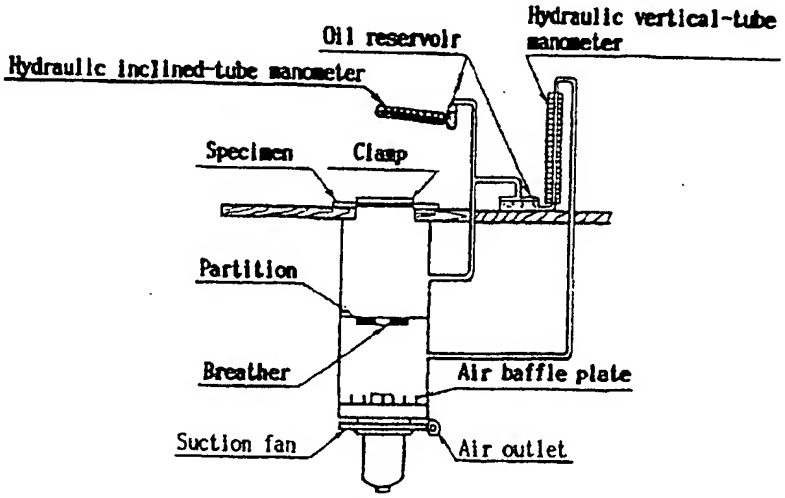

Fig. 11

5.11 Ventilation Staining Test

Sample out 430 × 430 mm specimens from the headlining products, and carry out the test according to the following procedure. At this time, test shall be conducted/not only on the general part but also on the curved part of the product:

(1) Install the specimen on the tester as shown in Fig. 12, so that there is no deformation of the specimen and air leakage from the clearance between the specimen and the tester.

(2) Adjust the differential pressure (between the ambient air and the suction chamber) to 19.6 Pa using the fan(9).

Note: (9)
In case the differential pressure is 19.6 Pa or more, in actual vehicle, adjustment is determined by agreement between the parties concerned.

(3) Light the xylene lamp under stopping the fan. Then cover the tester and let stand for 40 s.

(4) Turn off the xylene lamp, and send air 120 s.

Established/ 10 Revised: Dec.2002

(5) Detach the specimen, and remove the soot adhering to the surface. Evaluate the degree of staining on the specimen in grades in accordance with Table 5. Then report the staining.

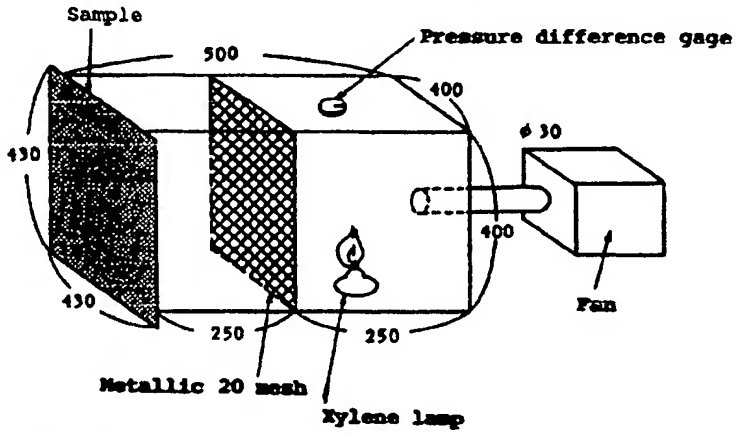

Fig. 12 Ventilation Staining Tester (Unit: mm)

Table 5 Grades of Staining

Grade	Criteria
5	Staining is completely absent.
4	Slight staining is found, but not clear.
3	Staining is clear, but not conspicuous.
2	Relatively extensive staining.
1	Extensive staining.

5.12 Glass Fogging Test

This test shall be conducted in accordance with Method A or B of TSM0503G. Test temperature shall be 80 ± 2℃.

5.13 Odor Test

This test shall be conducted under both dry and wet conditions according to TSM0505G.

Established/ 10 Revised: Dec.2002

Applicable Standards

TSL2612G	Specification for Roof Headlining Materials
TSL3603G	Hot Press Type Molded Headlining Materials
TSL3609G	Polystyrene Sheet for Molded Headlining
TSL3610G	Molded Head Lining Cover Materials
TSL3615G	Glass Mats for Molded Head Lining
TSL3616G	Polyurethane Mats for Molded Headlining
TSM0500G	Flammability Test Method for Interior Non-Metallic Materials
TSM0503G	Fogging Test Method for Non-Metallic Materials
TSM0505G	Smell Test Method for Nonferrous Materials
TSM0505G-1	Criteria for Smell of Non-Metallic Materials
ISO105A-01	Textiles--Tests for Colour Fastness--Part A01: General Principles of Testing
ISO105A-02	Textiles--Tests for Colour Fastness--Part A02: Grey Scale for Assessing Change in Colour
AATCC Evaluation Procedure 1	Gray Scale for Color Change

Established/ 10 Revised:
Dec.2002

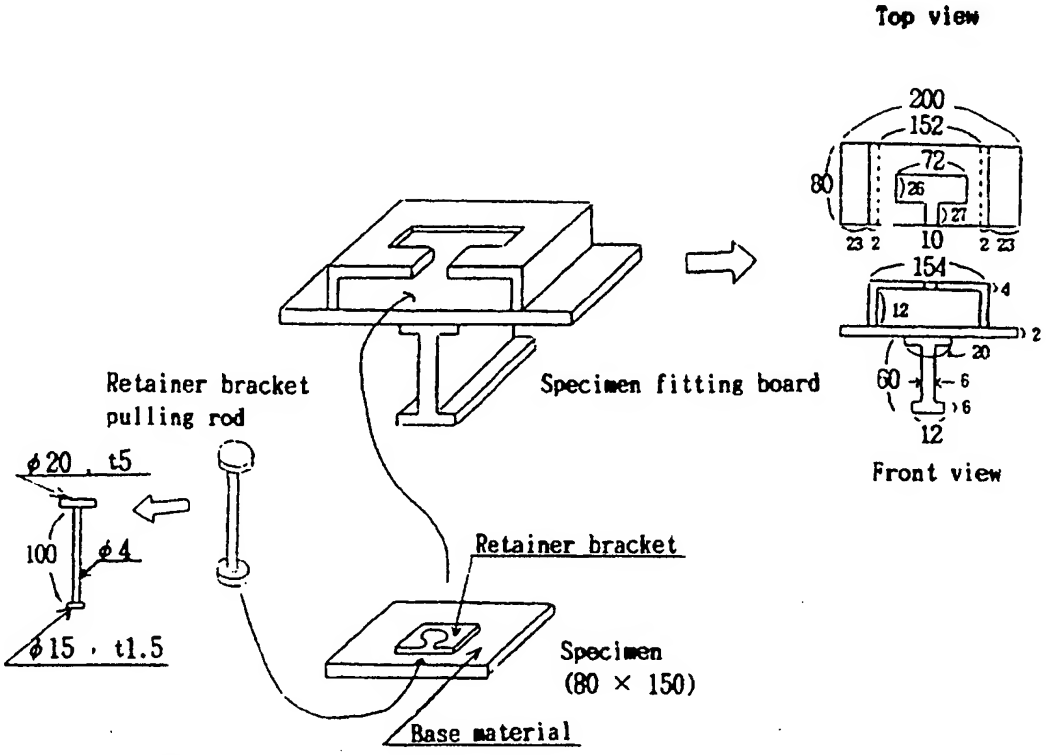

Fig. 10 Retainer Strength Measuring Jig (Unit mm)

(2) After heat aging
Condition the headlining product subjected to the heat aging resistance test in accordance with Section 5.4 above for at least 24 h at 23 ± 2℃. Then carry out the test of Section 5.9 (1) to determine the peeling strength (N).

(3) After humidity aging
Condition the headlining product subjected to the humidity aging resistance test in accordance with Section 5.5 above for at least 24 h at 23 ± 2℃. Then carry out the test of Section 5.9 (1) to determine the peeling strength (N).

(4) Low temperature condition
Sample out specimen of 80 × 150 mm from the portion of the headlining product including the retainer and maintain the specimen for 2 h in low temperature chamber set at -30 ± 2℃. Then determine the peeling strength (N) in accordance with Section 5.9 (1) in the atmosphere of -30 ± 2℃.

(5) High temperature condition
Sample out specimen of 80 × 150 mm from the portion of the headlining product including the retainer and maintain the specimen for 2 h in thermostat chamber set at 60 ± 2℃. Then determine the peeling strength (N) in accordance with Section 5.9 (1) in the atmosphere of 60 ± 2℃.

Established/ 10 Revised:
Dec.2002

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Product Name: Toyota - Glass Free HL			Test Series # :	Orig. Date:	Rev. Date:			Test Engineer: David Worodon
Customer Dwg / Level.:			Project #: 18434	Test Start Dates: Planned: Actual:		DV	PV	Product Engineer: Adam Chan/Kevin Tomasak Project Leader:
Test Letter	Test Method #	Test Description	Acceptance Criteria (include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
A	TSF7762G TM-OHS-002	**Heat Resistance Test - OHS** TSF7762G Dated Jun.1999, 5.1 Install the head lining product on a cut body equipped with the actual roof panel of the vehicle. Maintain it for 24 hours at 90°C ± 2°C. Condition it at standard test conditions, 24 hours at 23°C. Note: Specification requires only 1 hour. System is not stable after one hour of conditioning. Check for any defects in appearance, and measure the sagging of the ceiling. Then maintain it for 24 hours at 100°C ± 2°C. Condition it at standard test conditions, 24 hours at 23°C. Note: Specification requires only 1 hour. System is not stable after one hour of conditioning. Check for any defects in appearance of front and rear portions.	Free from defects in appearance such as surface peeling, wrinkling, deformation, torn seam and retainer separation. No obvious deformation, cracks and discoloration on the following components: Register, Overhead Console, RR Cooler Duct, and EA Structure. From customer drawing: a) The headliner shall not sag more than 1.7 mm along the front edge prior to exposure defined by TSF7762G. b) The headliner shall not sag more than 6 mm anywhere along the front edge nor more than 10 mm anywhere else after exposure defined by TSF7762G.					
B	TSF7762G TM-OHS-002	**Humidity/Cold/Thermal Cycle Resistance Test - OHS** TSF7762G Dated Jun.1999, 5.2 Install the head lining product on a cut body equipped with the actual roof panel of the vehicle. Carry out the following test cycle four times. - 23.5 hours at 50°C ± 2°C, 95%RH - 0.5 hours at 23°C ± 2°C - 7.5 hours at -30°C ± 2°C - 0.5 hours at 23°C ± 2°C - 15.5 hours at 90°C ± 2°C - 0.5 hours at 23°C ± 2°C Condition for 24 hours at standard test conditions. Check for defects in appearance and measure the sagging of the ceiling.	Free from defects in appearance such as surface peeling, wrinkling, deformation, torn seam and retainer separation. No obvious deformation, cracks and discoloration on the following components: Register, Overhead Console, RR Cooler Duct, and EA Structure. From customer drawing: a) The headliner shall not sag more than 1.7 mm along the front edge prior to exposure defined by TSF7762G. b) The headliner shall not sag more than 6 mm anywhere along the front edge nor more than 10 mm anywhere else after exposure defined by TSF7762G.					SIMILAR But LOWER TEMPS

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Product Name: Toyota - Glass Free HM.			Test Series # :	Orig. Date:	Rev. Date:			Test Engineer: David Wooden
				Test Start Dates:	DV	PV		Product Engineer: Adam Chan/Kevin Tomasak
Customer Dwg / Level.:			Project #: 18434	Planned:				Project Leader:
				Actual:				
Test Letter	Test Method #	Test Description	Acceptance Criteria (Include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
C	TSM0500G TSF7762G	**Flammability Test - OHS** TSM0500G Dated Apr. 1996. Sample out specimens according to the procedure and find the burning rate in accordance with TSM0500G Dated Apr. 1996. If the maximum of five replicates is 60 mm/min or higher, test another five test pieces. Report results in the form shown in Attached Fig. 1. Note: Components will be tested to be in compliance with FMVSS302. Â Per October 2001 version of TSM0500G an additional requirement was added: heat aging for 336 hours @ 70°C.	Maximum burn rate of 8cm/minute. Components required to meet this specification include: Roof Headlining, Cooler Duct, EA Structure, Roof Silencer. Component specifications include TSF7762G, TSF7204G, TSF7250G.					3.149 11/min
D	TSM0502G	**Vibration Durability Test - OHS** Perform according to TSM0502G, 4.4.3 Method B, dated Jun. 1998. Test 1.5 million vibrations at -30°C and test 1.5 million vibrations at 60°C.	Wire harness must not make any noise or any displacement during or after vibration durability test. Register, Dome Lamp, RR Cooler Duct, and EA Structure must have no obvious deformation and cracks. Overhead console must have no obvious deformation, cracks, and box opening.					DEFECTS ONLY
E	TSF7762G TM-GEN-011	**Light Resistance Test - Roof Headlining** TSF7762G Dated Jun. 1999, 5.3.1, Method A. Remove the base material from the specimen sampled out of a head-lining product, leaving only the surface material including the foam. Irradiate the sample 200 hours and evaluate for discoloration and fading. Irradiate the sample for another 200 hours (400 total) and evaluate for deterioration. Standard conditions includes one carbon arc lamp, an inside temperature of 55°C to 65°C, and a ~~black panel of 67°C.~~ Note: Black panel specification is 83°C. Express the degree of discolination Compare with an unexposed product.	Discoloration: Grade 4 or better. Fading: Grade 3 or better Deterioration: Free from such defects as fissuring and pile unraveling. (Gray Scale in accordance with AATCC Evaluation.)					MORE TOWARDS FABRIC

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Product Name: Toyota - Glass Free HL			Test Series # :	Orig. Date:		Rev. Date:		Test Engineer: David Woodon
				Test Start Dates:		DV	PV	Product Engineer: Adam ChanKevin Tomasek
Customer Dwg / Level.:			Project #: 18434	Planned:				Project Leader:
				Actual:				
Test Letter	Test Method #	Test Description	Acceptance Criteria (Include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
		Express the degree of discoloration and fading as a grade as given in Table 4.						
F	TSF7762G TM-GEN-010	**Heat Aging Resistance Test - Roof Headlining** TSF7762G Dated Jun.1999, 5.4 Heat the head lining product for 400 hours in a thermostatic chamber held at 90°C ± 2°C. Remove it and check for any defects in appearance. Do on rope rack.	Free from defects in appearance such as discoloration, wrinkling and surface peeling.					DEFECTS ONLY
G	TSF7762G TM-GEN-002	**Humidity Aging Resistance Test - Roof Headlining** TSF7762G Dated Jun.1999, 5.5 Maintain the head lining product for 400 hours at 50°C ± 2°C, 95%RH ± 5%RH. Remove it and check for any defects in appearance. Do on rope rack.	Free from defects in appearance such as discoloration, wrinkling and surface peeling.					DEFECTS But SAG MAYBE Issue With Duration of TEST
H	TSF7762G	**Peeling Strength Test - Roof Headlining** TSF7762G Dated Jun.1999, 5.6 Per discussion with Mike Bomas of TTC and Mr. Yamazaki of TMC on 4/7/00, 5 samples are to be tested in each direction for each condition and the minimum value for each set of 5 samples must be reported. Sample out 5 specimens of 150mm x 25mm parallel to the longitudinal and 5 in the lateral directions of the head lining products from their ordinary portions for each	Report all three conditions. The minimum peeling strength is 4.9N/25mm or surface material or base material shall be subjected to fracture.					

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Product Name: Toyota - Glass Free HL			Test Series # :	Orig. Date:		Rev. Date:		Test Engineer: David Woodun
				Test Start Dates: Planned: Actual:		DV	PV	Product Engineer: Adam Chan/Kevin Tomasek
Customer Dwg / Level.:			Project #: 18434					Project Leader:
Test Letter	Test Method #	Test Description	Acceptance Criteria (Include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
		condition. Peel from one end of the specimen (Fig. 1). Secure the peeled surface material separately with the chunks of an Instron type tensile tester, and peel at a velocity of 200mm/min. Find the mean of the maximal values in order to determine the peeling strength (N/25mm). Report the minimum value for each set of 5 samples for each condition. 1) Test in original state. 2) Expose specimens to Heat Aging (test 2.4) and then condition for at least 24 hours at standard test conditions. 3) Expose specimens to Humidity Aging (test 2.5) and then condition for at least 24 hours at standard test conditions. For information only, check for the peeling strength using the hand pull method as shown to us by Mr. Masuda of TMMNA in all deep areas. Perform for each of the above 3 conditions.						
I	TSF7762G	**Creep Test - Roof Headlining** TSF7762G Dated Jun.1999, 5.7 Sample out specimens of 150mm x 25mm parallel to the longitudinal and lateral directions of the head lining products from their ordinary portions. Maintain specimen 24 hours in a thermostatic chamber set at 90°C ± 2°C under a load of 0.98N (100gf) and measure the peeled length (mm) (Fig.8)	Maximum creeping is 50mm. Report the pooled state.					EXPANSION CONTRACTION

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Product Name: Toyota - Glass Free HA			Test Series # :	Orig. Date:	Rev. Date:		Test Engineer: David Woodam
Customer Dwg / Level.:			Project #: 18434	Test Start Dates: Planned: Actual:	DV	PV	Product Engineer: Adam Chan/Kevin Tomasek Project Leader:
Test Letter	Test Method #	Test Description	Acceptance Criteria (include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
J	TSF7762G	**Ventilation Staining Test - Roof Headlining** TSF7762G Dated Jun.1999, 5.11 Sample out 430mm x 430mm specimens from the head lining products and carry out the test. Install the specimen on the tester as shown in Fig. 11. Adjust differential pressure to 19.6 Pa using the fan. Light the xylene lamp under stopping the fan. Then cover the tester and let stand for 40 sec. Turn off the xylene lamp 30 sec later, and send air 120 sec. Detach the specimen and remove the soot adhering to the surface. Evaluate the degree of staining on the specimen in grades accordance with Table 5.	Staining must be a grade 3 or better.					EXPANSION/ CONTRACTION
K	TSF7762G TSM0503G	**Glass Fogging Rate - Roof Headlining** TSF7762G Dated Jun.1999, 5.12 This test to be conducted in accordance with Method B of TSM0503G Dated Jul. 1997. The photometric test will be used. Heating temperature is 80°C ± 2°C and cooling plate temperature is 20°C ± 1°C. Heating time is 3 hours. Evaluate one hour after completion of test. The Hart unit will used for the test.	The fog number must be 85 or higher.					DIFFERENT FOG TEMP 80°
L	TSF7762G TSM0505G	**Odor Test - Roof Headlining** TSF7762G Dated Jun.1999, 5.13 Toyota will conduct the Odor test in accordance with TSM0505G.	Strength to be 3.0 maximum. Degree of Unpleasantness to be -1.5 minimum. Quality: "Fishiness" and "Stimulation" to be 1.0 maximum.					

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Product Name: Toyota - Glass Free HL			Test Series # :	Orig. Date:		Rev. Date:		Test Engineer: David Woodon
				Test Start Dates: Planned: Actual:		DV	PV	Product Engineer: Adam Chan/Kevin Tomasek
Customer Dwg / Level.:			Project #: 18434					Project Leader:
Test Letter	Test Method #	Test Description	Acceptance Criteria (Include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
M	Cust. Dwgs. VR3243 VR2638 Note 9 TM-OHS-025	**Shore A Hardness - Roof Headlining** Perform Shore A Hardness per ASTM D2240-97	Shore A hardness to be a 50 minimum at assembly condition.					
N	TSL3616G	**Bending Test** Perform bend test per TSL3616G dated Oct. 1996, section 6.2.5. Specimen size is 50mm x 150mm Apply load at a rate of 50mm/minute. Use span of 100mm and radius of 3.2mm for supports and bearing nose. Test 5mm thickness as per the design. Determine the maximum load and the bending elasticity gradient. Note: Toyota specifies the fabric side up in Fig. 3 of the test method. Note: Test 2. Added per discussion with Mike Bernas of TTC on 3/16/00. Test is added for information only. 2. Perform bend test per TSL3616G dated Oct. 1996, section 6.2.6. Specimen size is 50mm x 150mm Set up test the same as in section 6.2.5 listed above. Leave the specimen to stand at an ambient temperature of 85°C for 5 minutes. Keeping that temperature, carry out the test conforming to section 6.2.5.	At RT, Maximum load = 9.8 N Bending elasticity = 29.4N/ 50mm/ cm At 85°C, Maximum load = 6.9N Bending elasticity = 14.7N/50mm/cm					
O	Cust. Dwgs. VR3243 VR2638 Note 9	**Permeability Test** Test according to ASTM D737 - 96. Find the air flow rate through the specimen in L/cm²/s.	The maximum air flow rate is 0.0003 L/cm²/sec.					
P	Cust. Dwgs. VR3243 VR2638 Headliner Assembly Note 3 TM-OHS-026	**Glued Component Adhesion Test** HIC foam, washer hose, and ducting adhered securely.	All components that are adhered to the "C" surface of the headliner, shall remain firmly attached after environmental conditioning and the appropriate pull forces have been applied.					

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Duct Name: Toyota - Glass Free H/L	Test Series # :	Orig. Date:	Rev. Date:	Test Engineer: David Woodon
		Test Start Dates: DV	PV	Product Engineer: Adam Chan/Kevin Tomasek
Customer Dwg / Level.:	Project #: 18434	Planned:		Project Leader:
		Actual:		

Test Letter	Test Method #	Test Description	Acceptance Criteria (include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
P (cont.)	Cust. Dwgs. VR3243 VR2638 Headliner Assembly Note 3 TM-OHS-026	**Glued Component Adhesion Test** Continued						
	Cust. Dwgs. VR3243 VR2638 Headliner Assembly Note 3 TM-OHS-026	Deviation for ED testing: Condition the overhead system at -30°C for 3 hours. With the overhead system on the floor of the chamber (fabric side down) pull on selected component locations marked by the Simultaneous Development Team members. 1. Condition the overhead system (OHS) at -30°C for 3 hours. With the overhead system on the floor of the chamber (fabric side down) pull on selected component locations marked on the measurement location picture. Allowable deviation: remove OHS from the chamber and immediately pull on selected component locations. 2. Condition the overhead system at 85°C for 3 hours. Remove the OHS from the chamber and immediately pull on selected component locations marked on the measurement locations picture.						
		Glued Component Adhesion Test HIC foam, washer hose, and ducting adhered securely.	All components that are adhered to the "C" surface of the headliner, shall remain firmly attached after environmental conditioning and the appropriate pull forces have been applied.					
Q	Cust. Dwgs. VR3242 VR3004 Note 4	**Headliner Deformation** Headliner may deform no more than3 mm around the perimeter of any component upon application of a 20 Newton force.	May deform no more than 3 mm around the perimeter of any component. Per John Showalter, 8/21/02, Toyota measures gap between headliner and component.					LOAD TEST 20N INSTALLATION EFFORT
R	VR18-A007 RDDP test TM-GEN-005	**Insertion Efforts** Insert headliner into sheet metal. Take efforts at each attachment point. Component level testing.	6Kgf max.					

JOHNSON CONTROLS

PRODUCT TESTING SECTION

oduct Name: Toyota - Glass Free HL			Test Series # :	Orig. Date:	Rev. Date:			Test Engineer: David Wooden
				Test Start Dates:	DV	PV		Product Engineer: Adam Chan/Kevin Tomasok
Customer Dwg / Level.:			Project #: 18434	Planned:				Project Leader:
				Actual:				
Test Letter	Test Method #	Test Description	Acceptance Criteria (Include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments:
S		**Heat Age** 7 days at 85°C						
V	ASTM D790 GM2745M	**SST (General Motors)**	Report data					
X	63311-500NL- Special Test	**Edge Variance** Section of front edge mounted and go thru environmental	Report edge sag as if it were in a body buck. Max. sag 1mm and 2 in L-direction					
Z	TSL3616Q	**Mat testing** Thickness	Report					
AA	TSL3616Q	**Mat testing** Mat surface density	Report					
AB	TSL3616Q	**Mat Peeling** Mat peeling strength original, after heat age and after humidity aging. Specimens: 3 min. cross-car, 3 min. fore-aft Lower value of the mean values .... shall be reported as the test results.	4.9 min. and no adhesive failure.					
AC	TSL3616Q	**Bending Test** Bending elasticity Specimens: 3 min. cross-car, 3 min. fore-aft Lower value of the mean values .... shall be reported as the test results.	29.4 N/cm					
AD	TSL3616Q	**Mat testing** Max. Binding load at 85°C	6.9 min.					
AE	TSL3616Q	**Mat testing** Bonding elasticity gradient at 85°C	14.7N /cm					
AF	TSL3616Q	**Mat testing** Dimensional change by heating	+/- 1%					
AG	TSL3616Q	**Mat testing** Dimensional change by moisture absorption	+/- 1%					

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PRODUCT TESTING SECTION

.oduct Name: Toyota - Glass Free HA.			Test Series # :	Orig. Date:		Rev. Date:		Test Engineer: David Wooden
				Test Start Dates: Planned: Actual:		DV	PV	Product Engineer: Adam Chan/Kevin Tomasek
Customer Dwg / Level.:			Project #: 18434					Project Leader:
Test Letter	Test Method #	Test Description	Acceptance Criteria (Include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (R/C if app.)	Comments
AH	TSL3616G	**Mat testing** Coefficient of linear thermal expansion	2 X 10^{-5} max.					
AI	TSL3616G	**Mat testing** Glass fogging rate	report					
AJ	TSL3616G	**Mat testing** Flammability	100max.					SEE SPECIFIED BURN RATE
AL	none	**Tape & Adhesive Evaluation** Evaluate samples after one week and continue a second week of the JCI standard environmental profile. [wire harness sections, washer hose sections, & stiffener with tape attached to overhead system sections]	All components should remain fully attached					
AL	TSF7762G Section 5.9 (4 TSM-OHS-23	**Tape & Adhesive Evaluation** Sample out specimen of 80 x 150 mm from the portion of the headlining product including the retainer and maintain the specimen for 2 hours in low temperature chamber set at -30 ± 2°C. Peel from one end of the specimen (Fig. 7). Secure the peeled tape and substrate separately with the chucks of an Instron type tensile tester and peel at a velocity of 200 mm/minute in the atmosphere of -30 ± 2 °C. Observe the condition of peeling and find the mean of the maximal values (excluding abnormal values) from the chart thus obtained in order to determine the peeling strength (N/25 mm). JCI Product Engineer: Please do not completely peel the tape off the headliner.	Report the force vs. deflection graph					
AM	TSL3616G	**Peel Strength** 7.5.1 Original State. Prepare 25 x 150 mm specimens from cover material and pool surface material 50 mm from the foam parallel to the longitudinal direction (Fig. 4). Set this specimen onto Instron type tensile tester and pull it at a tensile rate of 200 mm/min to peel. Then obtain the peel strength and observe the state of peeling. Report the state of peeling for all the specimens	Foam material fracture. Report the peel strength (N / 25 mm).					

JOHNSON CONTROLS

PRODUCT TESTING SECTION

Product Name: Toyota - Glass Free HL			Test Series # :	Orig. Date:		Rev. Date:		Test Engineer: David Woodon
				Test Start Dates: Planned: Actual:		DV	PV	Product Engineer: Adam Chan/Kevin Tomasek
Customer Dwg / Level.:			Project #: 18434					Project Leader:
Test Letter	Test Method #	Test Description	Acceptance Criteria (Include R/C if app.)	Test Phase	Sample Quantity	Test Completion Date	Test Results (P/C if app.)	Comments:
		tested here. 7.5.2 After Heat Aging. Prepare specimens in the same manner as in Section 7.5.1 and heat them for 400 hours in a thermostat maintained at 85±2°C. After removal, cool them naturally in the laboratory for at least 6 hours. Perform the test in the same manner as in Section 7.5.1. 7.5.3 After Humidity Aging. Prepare specimens in the same manner as in Section 7.5.1 and expose them for 400 hours in a thermo-hygrostatic chamber maintained at 50 ± 2°C and 95 ± 5% RH. After removal, dry them naturally in the laboratory for at least 24 hours. Perform the test in the same manner as in Section 7.5.1.						
AN	JCI test TM GEN-033	**Tri-axial Fabric Characterization** Using the triaxial fixture on the MTS, Test 6 octagonal specimens of each type of fabric, at room temperature only. Crosshead rate/speed of 100 mm/min and deflect specimens to 50 percent deflection if possible or 50 mm (which ever comes first). Note: Please set up test/machine parameters to protect the load cells.	Report the fabric stretch in Newtons force, please provide plots of force versus axial strain.					
AO	Cust. Dwgs. VR3242 & VR3004, Note 8	**Curtain Side Airbag (CSA) Deployment**	Each component must not break at curtain side airbag deployment.					

TO: Fax: 574.296.7557
GARRY BALTICH @
FLEXFORM

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Form
PD-FM-10-11-B: 2/05/99

Test Method
OKS-005

From: JCI, ADAM CHAN
Tel: 616.394.1036
Fax: 616.394.8000
email: Adam.W.Chan@JCI.com

Test Name: Cantilever Beam Sag Test

Laboratory Manager Approval: Scott Spykerman **Date:** 1/26/98

Lead Test Engineer Approval: Tony Elenbaas **Date:** 1/26/98

Revisions

Level	Date	Description	Originator
A	3/5/92	Release	Jerry Veen
B	3/23/96	Editorially revised and converted to Word document.	Len Bareman
C	10/23/97	Replaced calipers with digital height gauge and changed descriptions in sec 3.1 and 3.3 to improve procedure repeatability.	Katie Waghorn
D	7/12/01	Different specimen size, record thickness, new method of attachment, simplified measurements	Alan Kovacich

1.0 Purpose and Scope

This test is used to determine the heat deflection characteristics of a material. This is a relative test: it can be used to evaluate a new material to a standard, or to compare several different types of new materials to each other.

2.0 Equipment/Apparatus

2.1 Cantilever Sag Fixture (see diagram 1)
2.2 Digital Height Gage
2.3 Circulating air chamber capable of temperature and humidity specified by material performance requirements
2.4 Steel rule dies – 76.2 mm x 304.8 mm

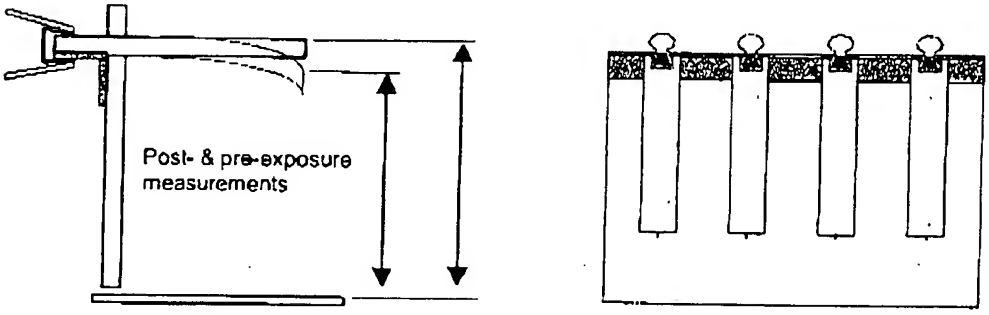
3.0 Test Procedure

3.1 Cut flat, constant thickness samples of the material with the steel rule die and a clicker press. If possible, use material that is a nominal processing thickness. Use a minimum of three samples of each material type. Each test should include at least one standard sample if available.

JOHNSON CONTROLS

3.2 Measure and record the thickness of each specimen.
3.3 Constrain the samples in the fixture with an appropriately sized spring clip, fabric side down. Insure that the clamped end of the sample is not being obviously crushed or pinched, as this will effect the sag results. A piece of 1" angle-iron will allow a consistent 1" of support.
3.4 Place a reference mark at the top-center of the suspended end of each of the specimens.
3.5 Measure with the height gage the distance between the top-center of the free end of each sample (at the reference marks) and the base of the fixture (see diagram) and record.
3.6 Place the fixture in an air circulating environmental chamber for a specified time period with the specified conditions.
3.7 Remove the fixture at the end of the exposure period and allow it to return to room temperature.
3.8 Repeat measurement of each sample per step 3.5, and determine sag values.

4.0 Diagrams



5.0 Data/Observations

Report thickness of the specimens and the sag in millimeters.

6.0 Precision and Bias

None

7.0 Miscellaneous Notes

7.1 Fixtures should be made of materials that are not permanently effected dimensionally by exposure to the temperature or humidity referenced in this lab method.

JOHNSON CONTROLS

8.0 Related Documents

8.1 Applied Standards and Revision Levels

None

8.2 Referenced Standards

8.2.1 None

Test Name: JCI Strength, Stiffness, Toughness (SST) Test

Laboratory Manager Approval: Scott Spykerman **Date:** 4/9/01

Lead Test Engineer Approval: Arnie Suigussaar **Date:** 4/9/01

Revisions

Level	Date	Description	Originator
A	4/9/01	Initial Release	Arnie Suigussaar

1.0 Purpose and Scope

The purpose of this test is to measure flex properties of headliner samples. It can be used for any type of headliner provided the samples are flat and can provide a 3" x 12" sample. An alternate sample size is 3" x 8".

2.0 Equipment/Apparatus

2.1 Steel rule die 3" x 12" (or 3" x 8")
2.2 Clicker press
2.3 Instron testing machine

3.0 Test Procedure

3.1 Cut headliner coupons on clicker press. Place headliner on bottom platen of press, fabric side up. Place die on top of sample with blades down.

3.2 Instron set-up:

a) Set span at 152mm (6 inch)
b) Roller diameter of 19mm (0.75 inch)
c) Test with fabric side down
d) Instron speed of 50 mm/min
e) Measure the thickness of the substrate only, using a micrometer with a clutch. Peel back the foam near the center line if possible. (For non-wovens without foam on the coverstock, measure the entire thickness)

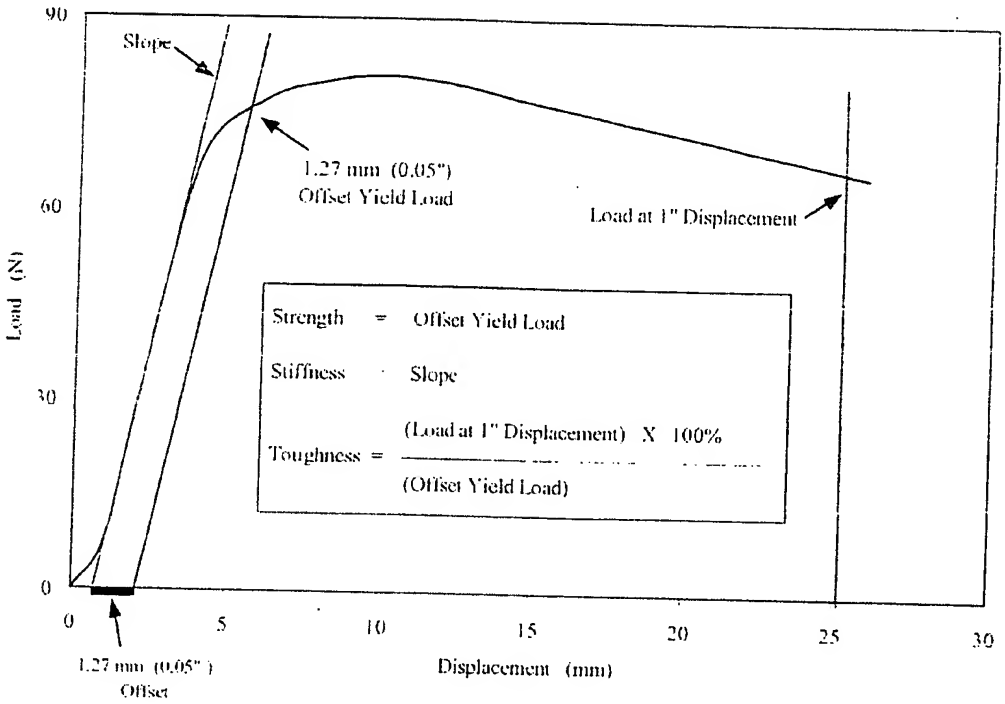
Stiffness is defined as the initial steepest slope of the force – displacement curve. Stiffness is analogous to the elastic modulus but is not independent of sample size or geometry.

Strength is the offset yield strength from the flexural load – displacement curve. Set the offset yield at 1.27 mm (0.05")

Toughness is defined as the load at 1" displacement, divided by the offset yield load, multiplied by 100%. (Subtract the toe slack)

3.3 Test samples and report the results.

4.0 Diagrams



5.0 Data/Observations

6.0 Precision and Bias

Not applicable

7.0 7.0 Miscellaneous Notes

8.0 Related Documents

8.1 Applied Standards and Revision Levels

8.2 Referenced Standards

ASTM D790-98

Wigglesworth FIBRES

Uses of Sisal

Traditionally sisal was the leading material for agricultural twine ("binder" and "baler" twine) but the importance of this is now tending to diminish (with competition from polypropylene and other techniques) although there is still a major business between Brazil and the United States.

Apart from ropes, twines and general cordage sisal is used in both low-cost and speciality paper, dartboards, buffing cloth, filters, geotextiles, mattresses, carpets and wall coverings, handicrafts, wire rope cores and macramé.

In recent years sisal has been utilised as a strengthening agent to replace asbestos and fibreglass and is increasingly a component used in the automobile industry, where its strength, "naturalness" and environmentally friendly characteristics are greatly appreciated.

Sisal Information

A Brief History

The Plant

Uses of Sisal

Sisal Grading

BARNES & THORNBURG LLP

600 One Summit Square
Fort Wayne, Indiana 46802
(260) 423-9440

PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Customer No.:	**23641**
Application No.:	10/630875
Confirmation No.:	7941
Filing Date:	July 30, 2003
Attorney Docket No.:	29595/82608
First Named Inventor:	Garry E. Balthes
Group Art Unit:	1771
Examiner Name:	Jennifer A. Boyd
Title:	LAMINATED COMPOSITION FOR A HEADLINER AND OTHER APPLICATIONS

RESPONSE PURSUANT TO 37 CFR § 1.116
EXPEDITED PROCEDURE
GROUP ART UNIT 1771

Certificate Under 37 CFR 1.8(a)
I hereby certify that this correspondence is being facsimile transmitted to Examiner Jennifer Boyd, United States Patent and Trademark Office; Fax No. (571) 273-8300.

on May 10, 2006

Zellma Grunden

Zellma Grunden

AFFIDAVIT PURSUANT TO 37 C.F.R. § 1.132

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I declare as follows:

1. I, Garry E. Balthes, am currently the President of Research, Development and Consulting at FlexForm Technologies, LLC. I have been employed at FlexForm Technologies, LLC since March of 2001.

2. I am a named inventor of the above-referenced patent application and I am, therefore, knowledgeable about the disclosure and claims therein.

3. I have experience with composite and laminated structure technologies. I have been developing and manufacturing such composites since August 1992. Prior to this date, I served as Manager of Research and Development for 15 years, mostly in mechanical construction, and have previously received both Canadian and United States Patents on mechanical inventions.

4. I understand that in the Office Action dated January 30, 2006, in the above-identified application, the Examiner has rejected Claims 19-26 on various references including the Jarrard et al. Patent (U.S. Patent No. 6,871,898). It is my understanding that the basis for this rejection is that the Examiner believes the flexible "soft cover top" for a convertible automobile is the same thing as a "headliner for a vehicle" comprising a "headliner core layer" from the claimed invention.

5. The flexible soft cover of a convertible automobile top is not the same thing as a rigid flexible headliner. On its face, one skilled in the art clearly understands the distinction between soft flexible automobile convertible cover tops and rigid automobile headliners. As is commonly known, soft flexible convertible tops are made from fabric-like panel material. The soft cover top can be placed on a frame that moves the soft cover over-top or away-from the passenger compartment of an automobile.

6. Conversely, a headliner is a rigid structural panel body that is located in the passenger compartment of an automobile above the head of the occupant. Such headliners are required to demonstrate stiffness and rigidity (among other parameters) in order to qualify as a headliner. This is not to say that such parameters cannot vary, rather, there needs to be some level of rigidity that a fabric-like material, such as the soft cover disclosed in the Jarrard et al. patent, cannot achieve.

7. To further demonstrate the distinctions between a "headliner" and a "soft cover" convertible top cover, accompanying this declaration is a "Statement of Work for Class 3 Recyclable Headliner" specification by Johnson Controls dated October 1, 2002. Of particular interest is the Benchmark Data section from pages 28-29. Acceptable headliners in this example

must have an offset yield strength minimum of 17N; a stiffness minimum of 5.0N/mm; and a toughness minimum of 70%. Furthermore, the Cantilever sag test requires deflection of less than 10mm. In contrast, the flexible soft cover disclosed in Jarrard et al. must be sufficiently flexible to be bendable to an angle of 45° when applying a force as little as 100 g*cm in its Cantilever bend test. (See col. 2, lns. 6-12.) Clearly one skilled in the art can easily recognize the distinctions between a "headliner" or "headliner core layer" and a flexible soft cover convertible top.

8. The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and, further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Declared at ELKHART, Indiana, this 5TH day of MAY, 2006.

Garry E. Balthes

State of Indiana)
) ss:
County of LaGrange)

On this 5 day of May, 2006, before me, a Notary Public in and for the County and State aforesaid, appeared Garry E. Balthes, to me personally known to be the same person whose name is subscribed to the foregoing instrument, and acknowledged that he executed said instrument as his free and voluntary act and for the uses and purposes therein expressed.

Nancy Peterson
Notary Public

Nancy Peterson
Printed Name

My Commission Expires: 2/4/12
County of Residence LaGrange

JOHNSON CONTROLS	**Statement of Work** **Class 3 Recyclable Headliner**

Toyota '06 Headliner

Supplier Statement of Work

Component Sourcing

Revision	Date Released	Date Approved	Changes (in red font in the body of the document). A ~~strikethrough~~ font marks deletions until approved.
A	7/1/03		Release to suppliers

GREG - SEE PAGE 28

BENCH MARK
SECTION 1. C.

STIFFNESS

Table of Contents

Supplier Statement of Work (SSOW): Instructions and Responsibility:

- The Program Manager is responsible to ensure that the SSOW is completed and updated as needed.

- The prospective supplier reviews the SSOW and the SSOW Terms and Conditions found at www.jcimanual.com, and the Purchase Order terms and conditions found at www.johnsoncontrols.com/asg/asg-terms.htm
- The Buyer and the SDT are jointly responsible to update the S-SOW form when information, specifications or scope changes occur.

- Page two of the SSOW is the Responsibility Matrix.
    - The Johnson Controls Program Manager completes the responsibility matrix.
    - Typical responsibilities are shown for Purchasing Class 1, Purchasing Class 2,and Purchasing Class 3. JCI Program Manager shall indicate which party (JCI or Supplier) is responsible for each item.

Sourcing Concept Not Applicable.

Supplier Statement of Work (SSOW): Definitions:

Model Year MY2006 Launch
Customer Toyota
Vehicle Assy Location N/A
Program Name **Glass Free Initiative**
Product **Headliner**
JCI Manuf Plant(s) Maplewood/Cottonwood
JCI SOP Date 7/4/05
Supplier Name TBD
Program Manager
Buyer Jim Koerner
AQE TBD
Product Engineer Adam Chan and Kevin Tomasek
Program Life 7/4/2005 through 7/4/10
CAD format N/A
Delivery Mode Batch
OEM Directed Supplier No
Recyclability Requirement Proposed material must be able to be cleanly incinerated or recycled (Recyclable @ Class 3 or Better).
Plant Location Requirement N/A

Introduction

This document outlines the program management, engineering, design, quality, validation, packaging, commercial, timing service requirements and definition of responsibility associated with the development and production of the designated program. This Statement of Work sets forth certain responsibilities and obligations of the Supplier to JCI, if Johnson Controls (JCI) elects to issue a Purchase Order for the work described. This document does not guarantee Supplier any specific volume of business or any business at all from JCI. THIS STATEMENT OF WORK IS NOT INTENDED TO BE A SUPPLY AGREEMENT OR ANY PROMISE TO ENTER INTO A SUPPLY AGREEMENT. In the event Supplier enters into a contractual relationship with JCI (by receipt of a Purchase Order, Long-Term Agreement or other written contract executed by JCI designated as a form of supply agreement, hereinafter the "Contract"), the Contract will govern the terms and conditions of the Supplier-JCI contractual relationship. In the event of any conflict between a term of the Contract and a provision of this Statement of Work, the Contract will govern. In the event that a Contract has been or is entered into between Supplier and JCI, Supplier will meet the procedures and obligations of this Statement of and, if a Contract is consummated, these will become express warranties made by Supplier and JCI.

The Supplier Statement of Work incorporates by reference all of JCI's standard terms of Purchase (www.johnsoncontrols.com/asg/asg-terms.htm) and JCI's Supplier Manual (www.jcimanual.com). Supplier should review and understand these documents before accepting this SSOW.

Approvals and Contacts

The individuals designated as **Program Manager and Buyer** on page 1 of the SSOW are the Project Managers for Johnson Controls. Unless otherwise indicated in the Statement of Work, such persons will be responsible for all communications, including notices, acceptances and approvals of charges, or other items sent or received by the parties in conjunction with this Statement of Work. Supplier agrees to be bound by the requirements set forth herein. Any and all exceptions to these requirements must be communicated in writing to Johnson Controls within 2 weeks of the date of issue.

Section 1: Program Scope

1) The Supplier will provide components to JCI for the Program. The Supplier will be responsible for any combination of cost, program management, engineering, design, quality, tooling, process, validation, packaging, and manufacturing.

2) PURCHASING CLASS: As indicated on page 1 of the SSOW, work will be sourced the following category:

   a) Full Service Class 3: Full service supplier responsible for program management, engineering, quality, full design and process validation, tooling, packaging, manufacturing, feasibility and cost.

3) If indicated on page one of the SSOW, the Supplier shall be required to support this program from a plant in close proximity to JCI's plant in order to supply to JCI on a just-in-time basis. The Supplier and JCI will consult concerning the design and layout of the Suppliers nearby facility. In particular, the precise location of the plant in relation to JCI's plan and the configuration of its facilities will be established in a manner which facilitates efficient and cost effective deliveries of the product(s) to JCI.

4) The Supplier must obtain JCI written approval prior to implementing any changes in program direction and support. This requirement applies to design, engineering, manufacturing, staffing, facilities, timing, etc.

5) The supplier must be capable of supplying the JCI plant on a just-in-time basis. (All Suppliers).

Product Description

The general product description for this project is as follows.

JCI is seeking a supply base that can provide a headliner substrate, which satisfies the requirements found in APPENDIX A. These include, but are not limited to, a class three recyclable substrate that can successfully pass the testing requirements defined in APPENDIX B.

Section 2: Program Management Expectations and Requirements

1) Supplier is required to support all activities throughout the term of any written agreement with JCI per the attached responsibility matrix in on page two of the SSOW as well as any other assigned responsibilities.

2) The Supplier will provide JCI with a resource matrix and timeline identifying all personnel planned to support this program. The matrix will include name, title, years of experience, and level of support (i.e. dedicated or resource). The timeline will indicate when resources will be added and subtracted from the program.

3) The Supplier is required to provide on site support all pre-production and production product design, product development including but not limited to builds identified by MRD or program timeline at both JCI and OEM manufacturing sites. The Supplier is required to have technical and commercial resources available to support ongoing production.

4) The Supplier is responsible to create and maintain an open issue tracking document that will be updated and provided to JCI on a weekly basis.

5) When issues arise that may jeopardize program timing, quality, cost or delivery, it is the responsibility of the Supplier to notify in writing the JCI Program Manager, Plant Manager (after Start of Production) and JCI Buyer immediately.

6) The Supplier is responsible for holding quarterly project reviews on site at JCI. **(This may increase to monthly or weekly meetings as program issues dictate)**. The format for the project review will be defined by the Supplier but must include updates in the area of design, engineering, cost, timing, quality, tooling, manufacturing, logistics, facilities, safety, ergonomics and program risk.

7) The Supplier must communicate and obtain pre-approval of any key personnel changes of those working on the program. Issues regarding organizational changes are to be directed to JCI Purchasing and Program Management as soon as they arise.

8) The Suppler must support the JCI Product Launch System.

9) The Supplier is responsible to train Supplier program personnel with JCI and or OEM procedures and processes as required.

10) The Supplier is responsible to meet all program timing requirements. Overall timing milestones are specified in the timing summary. The Supplier is responsible to provide JCI program timelines for each full assembly, sub-assembly and component sourced to the Supplier. The time line must include all required tasks and be updated and provided to JCI Program Management on a weekly basis.

11) The Supplier must be responsive to JCI's requests in order to allow JCI to meet company and customer objectives. The Supplier will provide JCI with a 24-hour 7 day a week emergency phone number.

Section 3: Engineering Expectations and Requirements

1) The Supplier is responsible to provide Engineering support for the program, e.g., tracking and resolving issues, feasibility, attending meetings and events associated with the development of the supplied parts.

2) The Supplier is responsible to create and maintain an open engineering issue list to JCI format.

3) The Supplier is responsible to create and maintain a target tracking report. This report will track such items as weight, performance, fit and finish, etc.

4) The Supplier is responsible to meet or beat target objectives.

5) The Supplier is responsible to perform benchmarking studies, Quality Function Deployment, and consumer/customer research on all major systems and necessary components and incorporate improvements whenever possible.

6) The Supplier is responsible to reflect GD&T criteria in tools, gages and dimensional verification studies.

7) The Supplier is responsible for manufacturing feasibility and mistake proofing.

8) The Supplier is responsible for tooling feasibility.

9) The Supplier is responsible for the feasible assembly of supplied parts into receiving sub-assemblies or vehicle.

10) The Supplier is responsible to create and maintain an engineering bill of materials.

11) Unless otherwise notified, the Supplier is responsible to provide prototype and pre-production parts that meet all applicable quantity, construction, process, material, quality, and delivery requirements.

12) The Supplier is responsible to provide prototype (SEE #11) and pre-production parts with the proper identification and information. Identification and information should include, but not be limited to: part number, design level, material symbol, safety shields, cavity number, design/process deviations, shipping label, bar code, control numbers, dimensional data, capability data, chuck, effort data, performance data, appearance data, process data, etc. Failure to comply with requirements will result in re-submission.

13) The following are the validation responsibilities for Class 3 Suppliers:

a) Meet all applicable OEM CUSTOMER, FMVSS and JCI specifications that pertain to component level validation of process.

b) JCI reserves the right to request a Supplier plan to conform to all required specifications prior to business award. Failure to present an acceptable plan could effect JCI's supplier selection.

c) Take ownership of and perform all necessary testing for process validation.

d) Create and maintain DVP&Rs using JCI provided form. (Currently DVP&R form WW-PLUS-FR-04-19).

e) Participate and take part ownership/responsibility with JCI in design and system vehicle level performance testing. The team will address any design and system failures.

Section 4: Design Expectations and Requirements

1) Not applicable to class 3 suppliers

2) Samples to be provided to JCI as originally agreed between Supplier and JCI.

3) Sample dimensions/size is to be agreed upon by JCI and Supplier.

4) Sample quantites to be agreed upon by JCI and Supplier depending on testing and availability of material(s).

5) JCI will require that the supplier provide a detailed BOM of the samples for evaluation of restricted substances and recyclability.

6) JCI requires that technical support for sample processing, testing, specification, and other information be provided with the samples so that a proper engineering analysis can be made of the samples.

7) Timing for samples to be agreed upon with the JCI and Supplier.

Section 5: Quality Expectations and Requirements

1) The Supplier will use and is responsible for the JCI Advanced Product Quality Planning Process and will communicate and track status to program milestones as required by the program AQE.

2) The Supplier will provide appropriate support for product development initiatives including DFA, DFMEA, PFMEA, process flow, control plan, lessons Suppliemed, etc. at JCI and OEM CUSTOMER facilities.

3) The Supplier is responsible to provide product to JCI at an incoming defective rate of zero (0) PPM.

4) The Supplier will analyze all warranty issues using a root cause 8D problem solving method.

5) If required, the Supplier will comply with the JCI MQR (Management Quality Review) Process as defined in the JCI Supplier Standards Manual.

6) It is expected that 100% of the Supplier Part Submissions (PPAP) will be on time and complete per the AIAG and JCI requirements as defined in the JCI Supplier Standards Manual, or any other written agreement.

7) The Supplier is responsible for part appearance and the appearance approval process. (The Supplier is responsible to gain OEM CUSTOMER approval for gate locations, parting lines, pre-grain approval, grain approval, color, gloss, knit lines and general surface appearance.) JCI will support the Supplier in this process.

8) Dimensional data will be provided and managed by the Supplier in support of all pre-production and production build events. "X " number of points per part, "Y" number of pieces (no less than 30) at OEM SPECIFIC builds. Parts must meet all tolerance and capability requirements. Additional points may be added to established capability or address critical areas or concerns. "X" and "Y" to be determined with JCI at prototype design release. Layout reports will be submitted per the AIAG Production Part Approval Dimensional Results form.

9) The Supplier must meet the following process capability requirements: $P_{pk} \geq 1.67$ on all significant (special) characteristics prior to OEM SPECIFIC build, and $C_{pk} \geq 1.33$ at OEM SPECIFIC BUILD.

10) The Supplier is responsible for all lab testing as determined by the Supplier, JCI and or the Customer. The testing results in the product Supplier Part Submissions (PPAP) must include the proper lab accreditation documentation.

11) The Supplier is responsible for gage and check fixture design, build, qualification and prove-out. JCI approval of the gage/check fixture supplier, gage/check fixture strategy and design is required.

12) The Supplier is responsible to hold periodic gage/check fixture design/build reviews.

13) The Supplier must achieve third party gauge certification prior to gauge GR and GR&R that is 10% or less of part tolerance.

14) GR&R must be less than 20%. GR&R to be performed per AIAG MSA Average and Range Methodology for Variable Data.

15) Gage and check fixture designs are to be done to the latest level of OEM CUSTOMER SPECIFIC CAD.

16) All gages and check fixtures will be production pull ahead CMM holding fixtures for OEM CUSTOMER SPECIFIC BUILD with variable data points added for production.

17) Supplier must have a Certified Quality System to meeting regional and OEM expectations (i.e.: QS9000, VDA61, TS16949) for all current pre-production and production locations. For all new locations, the Supplier must be certified within 6 months from start of production.

18) The Supplier is responsible to achieve OEM CUSTOMER approved visual harmony between parts sourced to the Supplier and the rest on the interior. Carry-over parts have equal requirements. (Where Applicable)

19) The Supplier is responsible for Process Sign Off and Supplier Part Submissions (PPAP) and all associated activity and parts required achieving Process Sign Off and Supplier Part Submissions (PPAP) approval. An onsite Process Sign Off will be conducted prior to Supplier Part Submissions (PPAP). Supplier Part

Submissions (PPAP) requirements are identified in the JCI Supplier Standards Manual available at www.jcimanual.com.

20) The Supplier is responsible to use a Design Of Experiments (or similar) process to establish and optimize the production manufacturing process (demonstrated at Process Sign Off) that meets or exceeds quality and delivery requirements in the most efficient way possible.

21) The Supplier must maintain process parameters displayed during Process Sign Off. Any changes to the process will require resubmission of Process Sign Off/Supplier Part Submission (PPAP).

22) The Supplier is responsible for on-going data collection and capability studies to be used as predictive indicators of the manufacturing process consistent with the product control plan.

23) The Supplier is responsible to support JCI's Process Sign Off and Supplier Part Submissions (PPAP) to JCI's OEM CUSTOMER.

24) Where applicable, the Supplier is responsible to obtain from JCI the date which is the beginning date for supplier to establish and maintain a torque calibration and control plan.

25) The requirements/expectations in the JCI Supplier Standards Manual and OEM CUSTOMER Supplier Quality Manuals supplement this statement of work must be met. (JCI Supplier Standards Manual available at www.jcimanual.com)

Section 6: Tooling Expectations

1) All tooling will utilize specified CAD format models as the master. All data will be exchanged in specified CAD format and must be used in the specified CAD format. Includes all tooling designs.

2) The Supplier will provide tool engineering to meet all JCI program and launch team requirements.

3) All JCI/OEM CUSTOMER owned tools are to be identified per JCI and OEM CUSTOMER specifications.

   a) The following items are considered tooling and therefore the property of JCI or the OEM:
      i) Tools specifically made for the production of a part or parts unique to JCI or OEM CUSTOMER.
      ii) Unique computer software required directly for the production and or gauging of parts for JCI or OEM CUSTOMER.

   b) The following items are **not** considered tooling and are **not** acceptable as part of a tooling bill, even if they are dedicated but not unique:
      i) Generic tooling, general-purpose items, processing or capital equipment, and computer hardware.
      ii) The cost of or associated with automation, test equipment, process control equipment, manufacturing Supplieming curve, launch costs, operator training, and vision cameras.

4) The Supplier will design and review all tooling to applicable JCI Tool Standards and Checklists where comprehensive tool building standards are not available.

5) The Supplier will obtain three (3) competitive quotes (minimum) for all tooling. The tool shop(s) selected by the Supplier will provide a tool cost breakdown that includes all tooling assumptions. This breakdown and copies of the three quotes will be provided as part of the quote package to Johnson Controls. The tooling source selection is the Supplier's decision, and should be based on overall value, but JCI reserves the right to reject a tool shop chosen by the Supplier.

6) Tool cost submitted to JCI is limited to the following: design of tools, tool build labor, tool build materials, one (1) tool sampling, and initial tool shipment to the manufacturing facility. Sampling cost is to be based on standard industry hourly rates plus the cost of material. Press setup and hookup charges for samplings are not acceptable. Costs of capability studies are considered part of the supplier's overhead. A general percentage markup of tooling is not allowed. JCI must be notified of, and reserves the right to be present for, any run-at-rates of new tooling.

7) JCI reserves the right to conduct validation audits of tool costs and record logs, at any time.

8) JCI reserves the right to decline payment of any tooling cost not supported by a JCI Tooling Purchase Order.

9) A Supplier that designs, develops, or manufactures special tooling in-house will provide all associated overhead costs in fully accounted tooling labor rates to JCI upon request. In addition, before placement of any tooling work with internal tool shops, the Supplier will provide evidence to JCI of competitive quoting with outside tool sources. Supplier records will be subject to audit.

10) Changes that occur while new tooling is being constructed are to be completed by the tool shop(s) currently constructing the tools. Cost of changes must be validated individually by review of the tool cost breakdown prior to issue of purchase orders. Changes that occur to tools after the tool build is complete are also required to have costs validated prior to issue of purchase orders. JCI reserves the right to conduct run-at-rates after changes have been completed.

11) Tool sources will manage tool shop and work schedules to meet JCI program requirements without additional charges. However, in those circumstances where overtime at a tool shop becomes necessary, JCI will consider requests for reimbursement for that overtime. JCI maintains sole discretion whether or not to reimburse such overtime. Prior to proceeding with work, it is necessary that these costs be reviewed and agreed to by a JCI Tool Buyer. Final authorization to proceed with a change must come from a JCI Tool Buyer by means of a Purchase Order.

12) JCI must be notified, and agree with, in advance of the transferring of tools from one manufacturing site to another. Any costs associated with the transfer of tools will be the Suppliers. JCI reserves the right to re-PSO after tools have been transferred. The Supplier is responsible for design and build of all tooling used to manufacture parts awarded to the Supplier and shall meet all applicable JCI Tool Standards.

13) The Supplier is responsible for the tooling for the entire life of the program, including the service period after production balance-out. Supplier will notify JCI in advance of implementing any change if any engineering change will impact tools for service requirements.

14) The Supplier/Tool Shop building the tools will comply with QS 9000, TE Supplement.

15) The Supplier is responsible for the tooling preventative maintenance and spare parts so as to meet all JCI manufacturing, delivery and quality requirements. Preventative maintenance plans must be documented and kept on file by the Supplier. JCI reserves the rights to review the Suppliers preventative maintenance and spare parts plans.

16) The Supplier will insure and protect said property against loss or damage.

Section 7: Packaging Expectations and Requirements

1) Supplier will design (with input from JCI), build, test and purchase all returnable and expendable packaging.

2) The Supplier must conform to all packaging requirements per the JCI Supplier Standards Manual.

3) The JCI Packaging Engineer must approve all packaging.

4) The Supplier is responsible for cleaning, maintenance, repair, replacement and containment of all returnable packaging.

5) The Supplier is responsible to assure there is enough returnable packaging in the system to maintain production +/- 15%.

6) All packaging testing must include a ride/shaker test per JCI specifications.

7) JCI reserves the right to assume the packaging and logistic responsibility and adjust the price accordingly.

Section 8: Commercial Expectations and Requirements

1) All engineering, design and validation testing services are the responsibility of the Supplier. Any charges to be amortized into the production piece cost must be broken out separately including resources, rates, hours, etc.

2) Any changes requested by JCI will be quoted using the variance RFQ form per the JCI Supplier Standards Manual.

3) Program model year is the model year identified on page one of the SSOW with SOP (Start of Production) scheduled for the SOP identified on page one of the SSOW

4) Program life is assumed to be the number of years identified on page one of the SSOW; provided, however, this is not a guarantee of business for the entire program life. The term of the parties' relationship shall be governed by written agreement.

5) Production piece price quotations will be based on a FPV (Financial Planning Volume) of identified on page one of the SSOW. **THIS IS NOT A GUARANTEE OF PRODUCTION VOLUME OR ANY COMMITMENT TO A STATED VOLUME.**

6) Vehicle assembly location is the location identified on page one of the SSOW

7) JCI manufacturing location is identified on page one of the SSOW.

8) Production piece price quotation will be based on FOB location as presented on the JCI RFQ form.

9) The Supplier is responsible to tool and capitalize to meet a CPV (Capacity Planning Volume) defined one page one of the SSOW unless otherwise defined as a lower volume per tool.

10) The Supplier is responsible to define all capacity constraints above the program capacity requirements for all tools, machines, facilities and suppliers.

11) The Supplier will base capacity calculations on two (2) eight (8)-hour shifts per day, 240 days per year.

12) If Production Supplier is Prototype Supplier, pre-production and prototype parts made from prototype tools, regardless of quantity, will be supplied at five (5) times production pricing.

13) Parts made from production tools, regardless of quantity, will be supplied at production pricing.

14) Set-up charges will not be paid for pre-production and production parts including engineering changes.

15) The Supplier will be expected to meet minority business sourcing goals, to report on their minority purchases, and to provide JCI with ways to increase minority content, reference the JCI Supplier Standards Manual.

16) Supplier will fully participate in the JCI PACT program as defined in the JCI Supplier Standards Manual.

17) Unless otherwise identified, the JCI payment terms will be net 45 prox. days.

18) Tooling will be reimbursed for Production tools after full Supplier Part Submissions (PPAP) approval and after receipt of funds from OEM CUSTOMER.

19) All quotes from Supplier will be in specified currency, with exchange rate listed if applicable.

20) Raw material, labor and burden costs, per the agreed upon quotation, are based on current year economics and are firm for the life of the program.

21) JCI reserves the right to direct and negotiate the resin and steel pricing. This price shall be used in the Supplier's quote.

22) All product or process changes must be communicated to and approved by JCI prior to implementation of change.

23) The Supplier will perform and supply to JCI results of a DOE establishing the most efficient process for each part that also meets all other quality and manufacturing requirements prior to PSO run at rate. This agreed to process will be demonstrated at PSO.

24) JCI reserves the right to review Tier II and Tier III supplier sources.

25) All expenses incurred by JCI to support tooling, processing and manufacturing of parts above and beyond what would normally be expected will be invoiced directly to the Supplier.

26) After engineering release for tooling, costs for changes required by Supplier to meet tooling, processing and manufacturing requirements are the responsibility of the Supplier.

27) Class 1 and 2 Suppliers are responsible to design parts that meet all of the stated requirements. Any costs associated with the parts not meeting the requirements are the responsibility of the supplier.

28) The Supplier is responsible to respond to all JCI quote requests using the JCI standard forms as found in the JCI Supplier Standards Manual.

29) Bank build coordination is the responsibility of the Supplier.

30) Supplier is responsible for managing and advising JCI on potential obsolescence during engineering changes, model year changes and production balance out.

31) Supplier is responsible for all capital equipment necessary to manufacture components and sub-assemblies including but not limited to injection mold machines, die-cut presses, vacuum-form machines, water-jet machines, work tables, sonic machines, specialty tools, material storage/handling racks, etc. Supplier will also be responsible for any specialized handling equipment needed at the Tier One location.

32) The Supplier is responsible for the accuracy of its quotations and cost breakdowns.

33) The Supplier is responsible to respond to engineering change requests using the JCI RFQ form. The completed response must be sent to the Account Financial Manager or Cost Analyst and Buyer within a time period not to exceed 5 working days of the request.

34) If required, the Supplier will comply with the JCI Business Review Process as defined in the JCI Supplier Standards Manual.

35) The Supplier will comply with the JCI SIDP (Supplier Individual Development Plan) as defined in the JCI Supplier Standards Manual.

36) In the case where the Supplier is co-located at a JCI or OEM Customer facility, the facility and related cost responsibilities will be defined in a separate agreement.

37) Cancellation: The Supplier must share the business risks as well as the opportunities associated with this program; therefore the quotation should not contain quantity buy, take or pay provisions. Contingent liabilities resulting from the cancellation of the program, if any, must be identified separately in writing. Cancellation or termination costs will be paid by JCI only as stated in the JCI Terms of Purchase. In any case completed parts and raw material inventories will not be reimbursed if found to exceed JCI approved inventory levels. JCI must approve in writing any inventory level exceeding the PO allowable level.

Section 9: Aggregate Service Requirement

A. Expectation

As an essential part of the the order, the supplier will provide service parts to Johnson Controls (JCI) to support OEM (customer) requirements for ten (10) years after the last production build date of the program ("EOP"). If the OEM extends the period of the required service parts term, the supplier agrees to abide by the extended period.

B. Service Part Pricing

All service parts will be provided at production-level pricing for 5 years after the EOP. The supplier can request adjustments to pricing after the 5th year of the service term , as provided in JCI's standard Terms of Purchase (available at **http://johnsoncontrols.com/asg/asg-terms.htm**) and as further detailed below.

C. Other elements of Cost

If there are additional cost elements, these costs must be submitted to JCI for consideration. The cost must be submitted as a separate quotation document and fully disclose a reasonable and justifiable cost breakdown. Additional cost elements that will be considered are:

- Packaging
- Special Handling
- Transportation

D. Set-up costs

Johnson Controls, Inc. and supplier will negotiate reasonable minimum runs to offset set-up costs associated with the service part after final build-out. Where minimum runs are not agreed to, set-up costs may be invoiced as a part of the service PO and will be paid only according to the terms and conditions reflected in the PO. Set-up costs must be supported with back-up data such as:

- Purchase orders
- Run dates
- Run quantities
- Program
- Ship-to Location

An agreed to cost model will manage set-up cost. All set-up cost submitted will be governed by the terms and conditions specified in the cost model. Where there is a minimum buy agreement no set-up charges will be applicable.

II. Tooling Terms

A. Life Expectancy
The tooling life expectancy will include the term of service depicted under the aggregate service requirement. The supplier will make a provision to tag each tool as a service tool after the life of the program as the tool enters service life. The supplier will properly maintain and store tools as may be required to fulfill all service parts obligations and other agreements between the parties.

B. Maintenance and PMs
The maintenance of the tool is the responsibility of the supplier. It is the responsibility of the supplier to do the normal Preventative Maintenance to keep the tool production ready. Any scrap generated as a result of a tool improperly maintained is the responsibility of the supplier.

C. Tool Assessment
The supplier will also provide, as a part of the program balance-out requirement, a tool assessment. The assessment will include an analysis of the quantity of parts the tool can produce before refurbishment and other tool conditions that may hinder performance during the term of service.

D. JCI Ownership of Tools
JCI is the owner of all tools except where expressly stated by JCI to be property and expense of the supplier. The supplier will clearly mark JCI's property as "property of Johnson Controls." The supplier will take all steps necessary to prevent any actions by third parties affecting JCIs' property and will inform JCI immediately if a third party intends to claim or encumber the property. The supplier will be solely responsible for the maintenance, care, safety and operation of the tools while in the possession of the supplier or its subcontractors.

E. Disposal of Tool
The supplier must obtain written approval of JCI before disposing of any tools. The supplier must disclose, at the request of JCI, the scrap value of tooling before the tool is disposed.

III. Minimum Quantities Terms

- Minimum quantities are allowed only through negotiation with Johnson Controls, Inc. and as expressly stated in a JCI purchase order (i.e. to fill a box, to cover set-up costs)
- Orders may be placed as an individual item (1 piece) or in multiples / standard pack quantities as agreed upon, including any agreement set-up cost as applicable.
- JCI reserves the right to make a bridge buy at any time.

IV. Releases

- Parts will be released per an approved EDI system.
- A 13-week schedule will be provided when applicable
- Supplier may seek JCI approval to ship multiple releases of the same part at one time on a quarterly basis.
- All obsolescence claims must be submitted to the supplier's assigned JCI Buyer using the appropriate JCI Supplier Obsolescence Claim procedure.

V. Quality

The service part quality must be maintained at PPAP level and the latest revision.

VI. Additional Terms

All service parts purchases will be governed by JCI's standard Terms of Purchase, available at **http://johnsoncontrols.com/asg/asg-terms.htm** or by calling 734-254-7500.

Quality Assumptions

1. JCI's goal is 10 PPM or less for this for this product.
2. Quality issues between JCI and Supplier will be addressed thought AIAG and commonly accepted process and practices.

Manufacturing Assumptions

JCI will be responsible to process a properly functioning H/L

Appendix A

Product Requirements

1. Substrate that is glass free
2. Meets Toyota performance spec TSF7762G – See Appendix B
3. 1200 gsm max, with a target of less than 1000 gsm
4. Cost: $\$4/m^2$ for substrate (does not include fabric covering)
5. Recycle level: 3 or better (can be incinerated)
   - Level 4 = Landfill
   - Level 3 = Clean incineration
   - Level 2 = Recycle into another stream (H/L to park benches)
   - Level 1 = Recycle into original product
6. Equipment/processes available:
   - Infrared Quartz Heater System
   - Forced Hot Air Convection
   - Heated Formed Tool

Product Requests

1. Airbag compatible
2. Design freedom – ability to stretch and form (minimum of 130% 3D elongation)
3. Fabric flexibility – compatible with nonwoven, knapped knit and non-knapped technical fabrics.
4. System capable – ability to carry components during shipping and assembly (grab handles, visors, etc.)
5. Performance flexibility – Ability to offer product at discrete performance levels, depends on the application (small truck vs. SUV).

Benchmark Data

1. Three (3) Point Bend Test
   a. See JCI PES00373, section VI, test 2 and JCI TM OHS-028 (see PES).
   b. Offset yield strength minimum of 17N.
   c. Stiffness minimum of 5.0 N/mm
   d. Toughness minimum of 70%
2. Cantilever Sag test
   a. See JCI PES00373, section VI, test 3.

b. Less than 10mm

3. Impedance tube for acoustics

   a. See JCI PES00373, section III, test 6.
   b. 17.5% Absorption @ 500 Hz, 27.5 % Absorption @ 1000 Hz, 30% Absorption @ 2000 Hz, 40% Absorption @ 3000 Hz

4. Air permeability/ventilation staining

   a. Ventilation staining = Staining must be a grade 3 or better
   b. For grade equivalent see Toyota Specification page 6 or 14, (table 4 in TSF7762G)
   c. See DVP&R test letter J
   d. Air Permability – Maximum air flow rate is 0.0003L/cm^2/sec
   1. e. See DVP&R test letter O

Appendix B

Validation/Testing Specifications. - Must meet Toyota Testing Specification (TSF7762G)

Initial Screening of all samples will be evaluated by the following tests – details on all of these tests can be found on the JCI DVP&R or PES

1. Three (3) Point Bend Test – See benchmark for acceptable passing criteria
2. Cantilever Sag - test See benchmark for acceptable passing criteria
3. Impedance tube for acoustics - See benchmark for acceptable passing criteria
4. Air permeability/ventilation staining – See benchmark for acceptable passing criteria

Appendix C

DVP&R – Toyota Specific

JCI Headliner PES 00373

Appendix D

Toyota Specifications (TSF 7762 G)

Appendix E - Roles & Responsibilities Matrix

R=Responsible, S=Support, A=Agree Upon

Program Management	JCI	Supplier	Comments
Program Staffing	R	R	
Program Timing	R	S	
Open Issues Tracking	S	R	
Monthly Program Reviews	S	R	Weekly to start
Follow Johnson Controls, Inc. PLUS System	S	R	
Personnel Training		R	
Risk Assessments	S	R	
Engineering	**JCI**	**Supplier**	**Comments**
Provide vehicle environment data	R		
Provide performance criteria	R		
Provide performance objectives / targets	R		
Material approval	S	R	
Perform in-vehicle tests	R		
Project Engineering Responsibility	R		
Manufacturing Engineering Responsibility	R	R	
Track and Resolve Project Engineering Open Issues	R	S	
Track and Resolve Manufacturing Engineering Open Issues	S	R	
Track and Resolve Target Objectives	S	R	
Engineering Feasibility	S	R	
Manufacturing Feasibility	S	R	
Engineering Bill of Material (BOM)		R	
Prototype and Pre-Production Parts		R	
Prototype Build	R	S	
Engineering Samples		R	
DVP&R	R	S	
Validation Test Parts	S	R	
Design Validation Testing (DV)	N/A		
Change Notification		R	
Change Management		R	
Provide Process Parameters	S	R	

Appendix F

Schedule/Timing